Wireless Appliance Control System

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Abstract ? The needs of centralized control system has been long identified in office and industry application. Nevertheless, the same concept can be extended to home application in which a residence can control certain object through a centralized control system. Thus, a wireless appliance control system for home is proposed in this paper. It makes use of the computer as digital control and monitoring system to control the entire appliance within a house. The system includes a computer as the control centre, RF transmitter and receiver, encoder and decoder in order to send the signal from user to a specific appliance. Visual Basic (VB) software has been chosen as the control interface between the user and the rest of the system to reach the specific object. VB provides not only neat interface but also a simple programming to communicate with the rest of the component block.

INTRODUCTION

The concept of control and monitoring has been ongoing for the last decade. It is used to control the operation on another side and to monitor the progress of the process itself. The interest in developing such system is to take the advantages of the system, such as remote control and monitoring in highly hazardous environment. In fact, the system can be integrated with a robot manipulator to enhance the capability.

It is expected that the remote control and monitoring system will become important in the future. The capability that being offered by this system is very important to improve the existing control system in the industry.

RELATED WORK

Development of control system through wireless network has opened a new dimension in the perspective of the system capability. It is associated with more applications with better implementation technique and more reliable output. For example, a wireless system to control a robot has been developed to serve a purpose to send certain instructions to the robot [1]. It includes of a basic unit of wireless transmission-reception, which allowed the implementation of a remote asynchronous system in the network.

It also allowed flexibility in the interconnectivity of the system, optimizing its functionality as distributed control system by several processors. The operation of this Manuscript received April 15, 2009. This work was supported in part by processor only requires of an external pulse to the input of the first asynchronous control block, and with this pulse the sequence of request-recognition of the control unit begins. Once concluded the program, the microprocessor stops and include inherently the stoppable clock feature; i.e., circu it is stopped if it is not required (minimal dynamic consumption).

Although there is debate whether the wireless network in control system, but it is proven that simulation can help develop a thorough understanding of wireless control systems. Among the advantage are the control system can be configured quickly, the results from modifications to control strategy can be implemented and tested scientifically, without time-consuming and difficult hardware implementation [2]. The important thing is that a wireless simulator must be capable of modeling the quality of the transmission medium to determine when a frame arrives in error.

Wireless monitoring system also employs reliable communication module which emphasizes on analyzing the question of anti-interference and low power consumption [3]. Through experimentation, the communication module is of small size, excellent anti-interference ability, low power consumption and high data rate. The same concepts also have been employed using Bluetooth technology [10].

Transportation industry also has applied the wireless monitoring system to design the speed of train [4], vehicle over speed on the highway [6] and to monitor the vehicle refrigerator [7]. The monitoring system integrates the technologies of sensor, Ethernet, and GPRS, and realizes the real-time data acquiring, wireless network transporting, and data

managing for train speed. The scheme also applies to other data acquiring and state monitoring systems, which lie in the remote area or locomotors system.

In oil and gas industry, intelligent wireless monitoring system can real-time on-line and remotely monitor the information of flux, pressure and temperature in the oil pipelines fluid [5]. It can achieve the efficient management of data and sharing of resources, and can realize the enterprise management's automation and information. Besides, it can receive the alarming and recovering information sent from the bad meters, which makes the staff in the open air solve the problem faster than the average with avoiding the hidden troubles like oil releasing.

The health industry employs Automatic patient monitoring is becoming an import part of any health care system [8] [12]. The challenge is to create a patient monitoring that is capable of providing a continuous, reliable and real time monitoring and data acquisition services while removing any restrictions on the patient condition.

The monitoring concept applied in agriculture can measure environment parameters on-line, such as temperature and dissolved oxygen (DO) content [9] and it could be expanded to assess the water quality as well [11].

Finally, the monitoring system has become essential component in building smart homes [13] – [16]. The technology is used to build a smart home service system that benefit in terms of cost, energy consumption and complexity. Various smart home service use cases such as washing programs, cooking, shopping and elderly health care are described as examples that make use of this system.

METHODOLOGY

The system development can be divided into five different parts; computer as the control centre, electronic forward circuit, electrical appliance, backward electronic circuit and backward display. The interconnection among the entire component block is shown in Figure 1.

The control centre, which is the computer, employs VB software as the interface of switch to control certain electrical appliance. Parallel port of RS-232 is used to interface between the control center and electronic circuit. Optocoupler is connected by parallel port to send signal through a light-emitting diode (LED) in order to activate photo transistor. The photo transistor will then detect the signal and allow encoder activation. The LED, in turn, will act as a circuit breaker since the signal cannot be sent if the LED is accidentally burnt.

The electronic forward circuit consists of RF transmitter and receiver, encoder and decoder. The encoder encodes the binary bit information from control centre to RF transmitter, which is then forwarded to RF re ceiver. A decoder decodes the signal received to original binary bit and thus turns certain appliance on or off. A maximum of 4 bits can be sent at one time due to only 4 outputs are available on encoderand decoder. The operation of RF transmitter and encoder is shown in Figure 2 whereas operation of RF receiver and decoder is shown in Figure 3.

The electronic backward part is basically used the same as the transmitter and receiver in electronic forward circuit but with different RF module frequency.

Backward display part is to display the condition of the target appliance either on or off. If the target appliance is burnt, the display LED will at control centre is turned off as well. Thus, it is useful to notify the user immediately if there is any malfunction appliance without perform regular check.

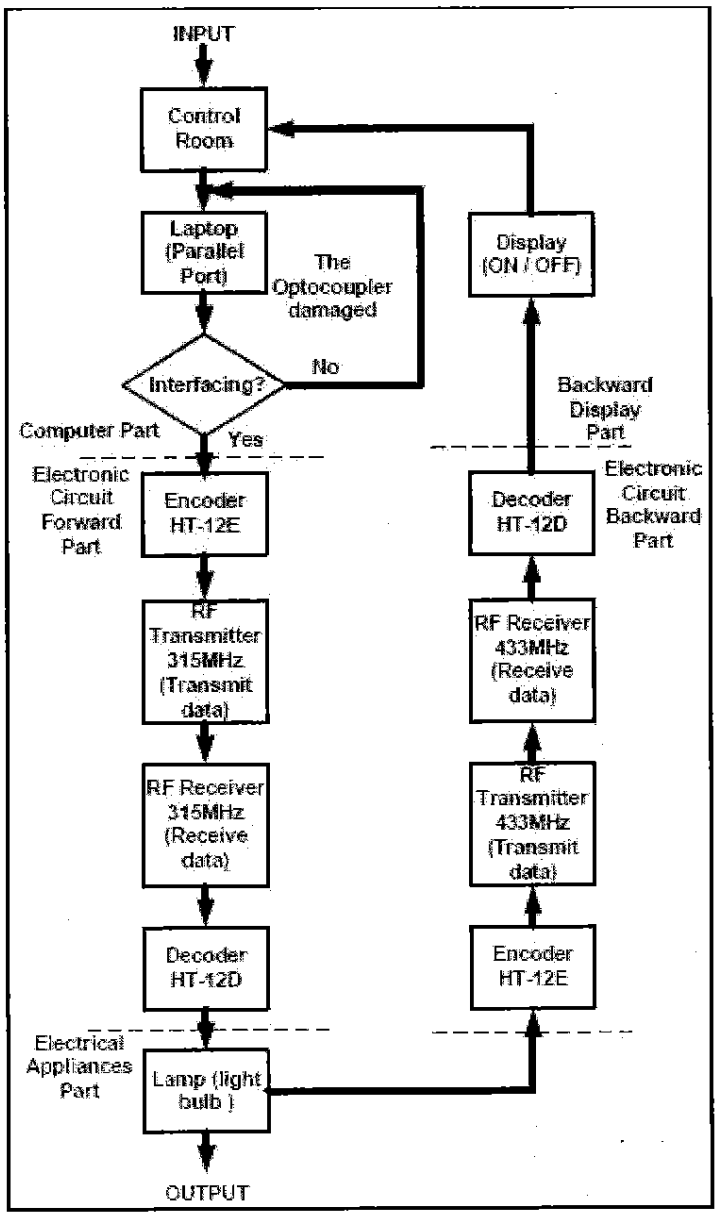


Fig. 1. Interrelation among the component block of the system

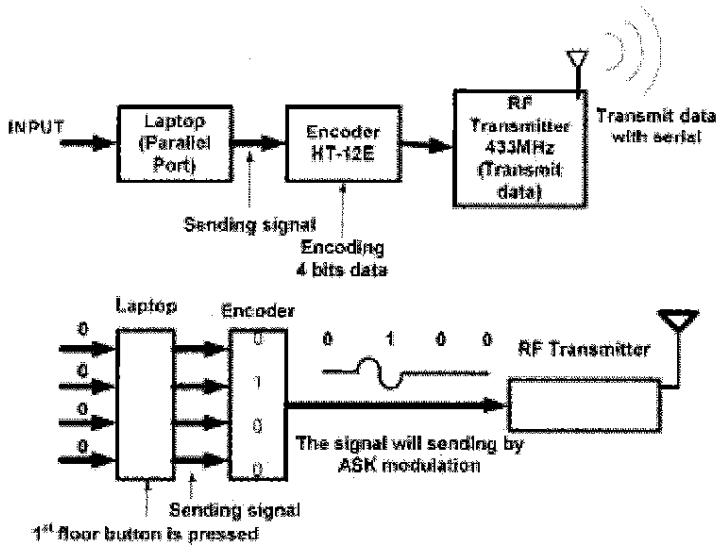


Fig. 2. The operation of RF transmitter and encoder

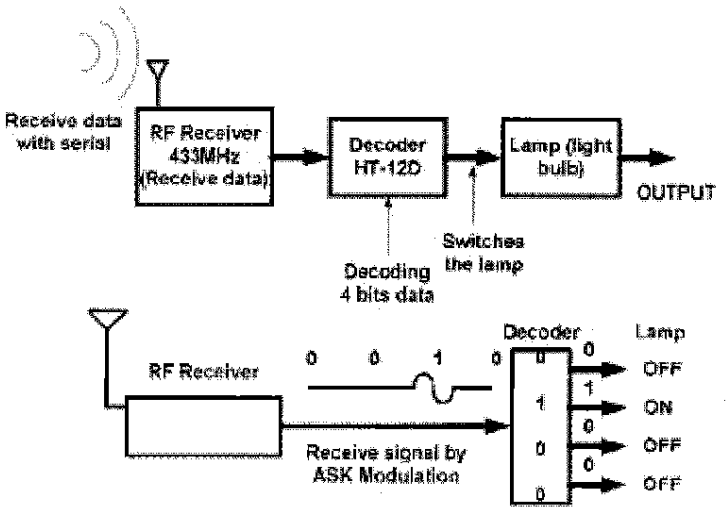
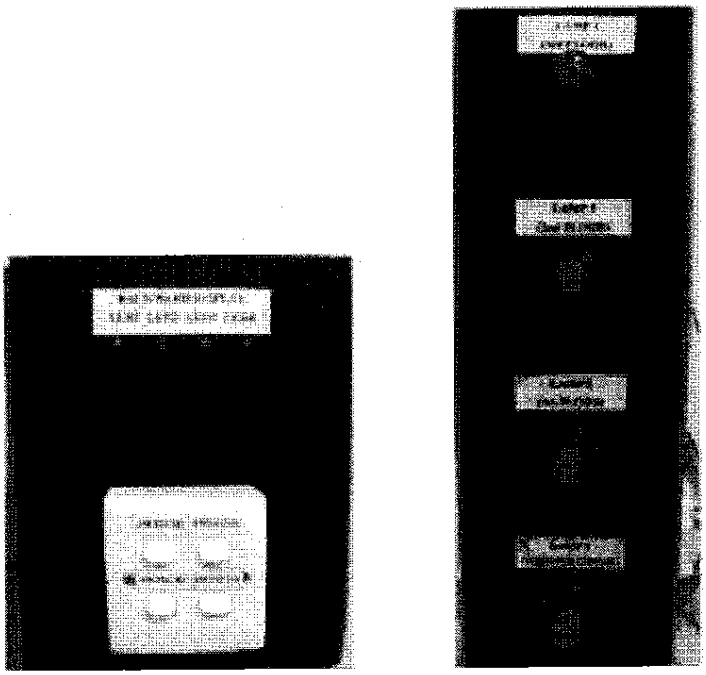


Fig. 3. The operation of RF receiver and decoder

RESULT AND DISCUSSION

Figure 4(a) shows the casing of the control centre which includes the electronic forward circuit, LED and switch whereas Figure 4(b) shows the layout of target appliance which includes electronic backward circuit, relay and bulb. Figure 5 shows the graphical user interface (GUI) in VB that is seen by user to enter the desired input. Figure 6 depicts the electronic forward circuit which used RF transceiver of 315MHz. Figure 7 shows the backward electronic circuit which used RF transceiver of 433 MHz and LED to represent the target appliance.

Figure 8 shows the sequence of operation of the system starting with input signal given by the user. There are five main steps in transferring the signal from user and finally turn on/off a specific appliance.



(a) (b)

Fig. 4. Casing of (a) control centre (b) layout of appliance

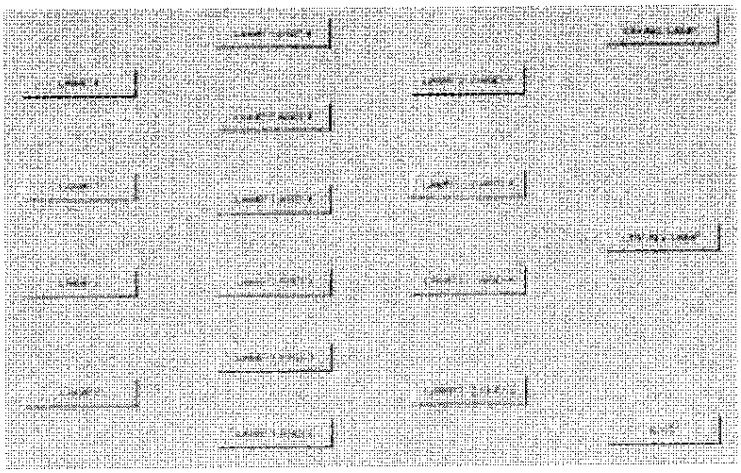


Fig. 5. GUI of control centre in VB

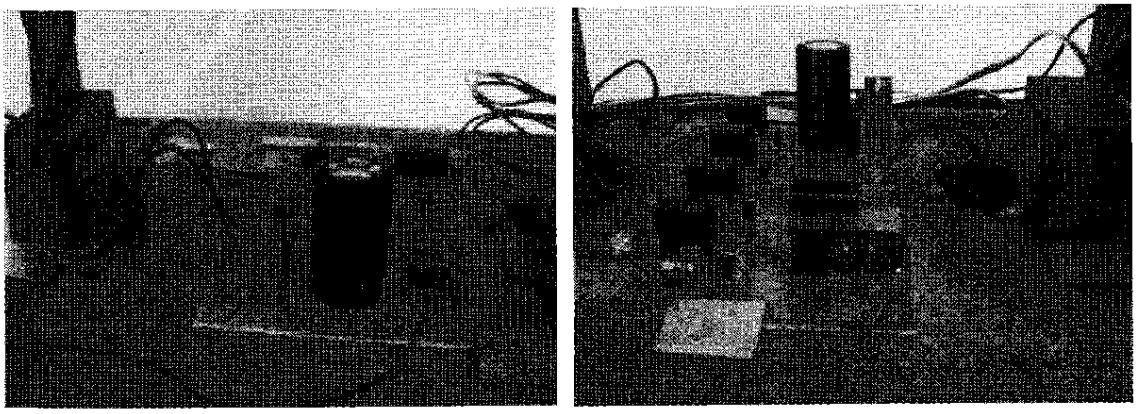


Fig. 6. Electronic forward circuit

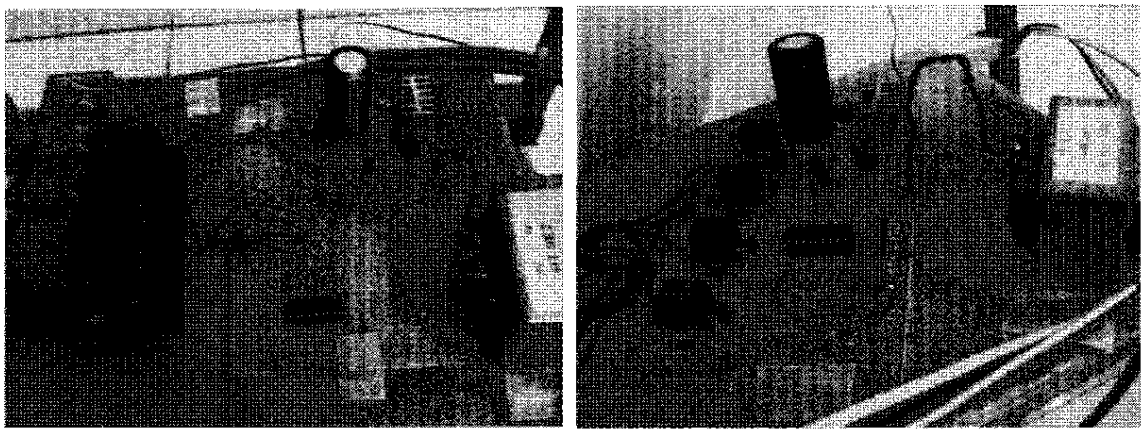


Fig. 7. Electronic backward circuit

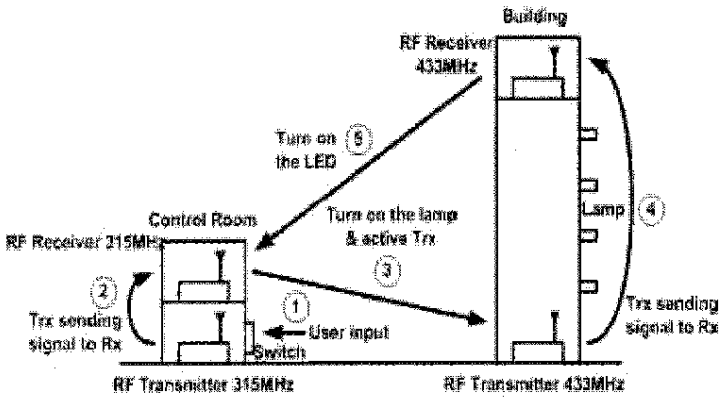


Fig. 8. Sequence of system operation

CONCLUSION

This paper successfully developed a wireless control system that allows a user to control home appliances remotely via a control centre. The control centre managed to turn on and off all target appliances through VB interface. This remote system obviously gives huge convenience to the user in term of control as well as monitoring capability. The only concern might be the speed of the parallel connection between the computer and the electronic circuit. Nevertheless, the established connection between user and target appliance shows that the speed of parallel connection is good enough for this system.

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